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With the passing of Paul Kunitzsch on May 7, 2020, in Munich, the field of Arabic studies has lost one of its great authorities, whose work has become a supporting pillar on which the study of the history of science in the Islamic world stands today.

Life

Paul Kunitzsch was born 14 July 1930 in Neu-Krüssow, a district part of the small town of Pritzwalk, about halfway between Berlin and Hamburg.[1] He was the eldest of two sons, born to Paul Kunitzsch, who worked as a teacher, and his wife Margarete. In 1937 his family moved to Berlin-Spandau, a Berlin locality nested

1 The following paragraph is closely based on the biography in "Paul Kunitzsch 70 Jahre," in *Sic itur ad astra. Studien zur Geschichte der Mathematik und Naturwissenschaften. Festschrift für den Arabisten Paul Kunitzsch zum 70. Geburtstag,* edited by Menso Folkerts and Richard Lorch, Wiesbaden: Harrassowitz, 2000, 1–6. Since it is written in German, it might be useful to have the complete information in English now.

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between the rivers Spree and Havel. In the midst of World War II, Paul visited elementary and secondary schools before transferring to the Kant-Gymnasium in 1944, a humanist grammar school that had relocated to Sędziejowice (then Sendewitz), near Łódź, but was gradually moved back to Berlin in 1945. After graduation in 1950, he entered the University of Munich at the age of 21 for his first summer semester as a student of Oriental Studies and Classical Philology. He met Anton Spitaler (1910–2003) for the first time, an encounter that would later become decisive for his academic career, and shortly after enrolling transferred to the Free University of Berlin in the winter of 1951. Paul Kunitzsch received his doctorate in 1956; one year later, he passed the state examination in classical philology and was invited to teach Arabic at the University of Göttingen by Hans Heinrich Schaeder (1896–1957). His appointment was not extended, however, and it might have seemed to him in that moment that this was the end of his academic career.

He worked at the Goethe Institute in Cairo as a lecturer for German until 1960, then in Germany until 1963. He became scientific advisor and member of the editorial board of the Arabic edition of Deutsche Welle, a public international broadcasting company in Germany. Then, in 1969, on the recommendation of Anton Spitaler, he received a two-year habilitation fellowship from the German Research Foundation. On 14 June 1971, he was awarded his habilitation at the Ludwig-Maximilians-Universität in Munich. Today, it seems almost unbelievable that he completed his habilitation thesis in only two years, especially looking at the result which would be considered excellent today.

Paul Kunitzsch became a university lecturer in Munich in 1975, associate professor in 1977 and finally full professor in 1978. In his language and reading classes for modern Arabic, he had his students read newspaper articles, essays, novel excerpts and texts on historical topics, and he held seminars on the Arab history of science. He remained in his position for almost 20 years until his retirement on 1 October 1995. Throughout his life, he travelled the Middle East, until travelling abroad became difficult because of his eye disease. But he still regularly took part in the monthly lunchtime sessions of the Ptolemy Group of the Bavarian Academy, where I saw him for the last time in January 2020.

Awards

Paul Kunitzsch received the Akademie-Preis der Philologisch-Historischen Klasse der Akademie der Wissenschaften in Göttingen in 1974. In 2006, the Freie Universität Berlin awarded him the Golden Doctor Jubilee with Certificate. On the occasion of the Second International Conference on the History of Science of the

Arabs and Muslims, which was held in Sharja in 2014, he received the Azophi Medal from the Arab Union of Astronomy and Space Sciences (AUASS).

From Star Names to Star Catalogues

The list of publications by Paul Kunitzsch comprises 367 titles, 27 of which are monographs.[2] The following presentation of his scientific achievements must therefore be selective. The two central themes in the scientific life of Paul Kunitzsch was the onomasiology of the stars and the star catalogue of the Almagest in the Arabic and Latin traditions.

His interest in the stars developed when the Kant Gymnasium moved out of Berlin and students were trained to observe the night sky. Kunitzsch began to read popular astronomical books and was impressed by some of the strange star names which he learned were of Arabic origin, soon after deciding to learn Arabic himself. He had received philological training from Max Krüger, one of the leading experts in teaching Latin. He had also familiarized himself with the structure of Semitic languages in a class in Hebrew at the Gymnasium. At university, he remained fascinated with astronomy, and the Arabic names of stars that had grabbed his attention as a teenager became the topic of his doctoral thesis. It was published in 1959 as a book titled *Arab Star Names in Europe*,[3] 150 years after the book by Ludewig Ideler, and it was the first comprehensive study on the subject, drawing on a variety of sources and based on a solid methodology. Unlike his predecessors, who provided etymologies based only on phonetic similarities, he established "zusammenhängende Traditionsketten" ("coherent chains of tradition") by using all available sources in chronological order. In 301 fully documented entries, he described the chains of tradition for lunar mansions, astrolabe stars, and individual stars. As a kind of supplement, he published his *Studies on the Stellar Nomenclature of the Arabs* two years later, which was dedicated to the genuine Arabic tradition of star names, without the restriction of having been received in the West, as was the case with the previous book. Notably, in this supplement, he separated ghost names from those belonging to the autochthonous tradition. He dedicated the main part to an alphabetical list of single stars, star

2 The bibliography in *Sic itur ad astra*, 7– 27 (as in n. 1), 7–27 contains 254 scientific publication, and is continued in the bibliography in this obituary, which contains Nos. 255–367; monographs are Nos. 1, 2, 4, 8, 35, 49, 66, 107, 110, 131, 133a, 133b, 133c, 134, 171, 181, 200, 223, 230, 234, 249, 282, 289, 297, 308, 329, and 331.

3 *Arabische Sternnamen in Europa*, Wiesbaden: Harrassowitz, 1959, No. 2.

pairs, asterisms, constellations, constellation parts, and celestial objects without stars, a total of 329 entries.[4]

In 1966, his *Types of Star Lists in Astronomical Manuscripts of the Tenth to Fourteenth Centuries* appeared.[5] With the exception of one German manuscript, it is based only on Latin manuscripts. The star lists in this vast source material are divided into 17 groups. Since such lists are often copied *en bloc*, they are important index fossils for the dating of astronomical works and astrolabes and for the discovery of dependencies. The study of the Latin reception of Arab astronomy had had a long history, but its reception in Byzantium had gone almost unnoticed. It was therefore groundbreaking when Kunitzsch published his 1964 study of the three Greek star lists by Georgios Chrysokokkes, and he had found that one was based on an ancient Greek tradition and one on an Arabic and a Persian work respectively.[6] For this reason, 1964 can be considered the founding date of research on the Arab-Greek tradition, since besides Kunitzsch's study David Pingree's *Palaeologan Astronomy* was published; until that year, almost nothing was known about this topic. The four previously mentioned publications by Kunitzsch together form a coherent report on the tradition of star names in the three most important pre-modern cultural areas of the Mediterranean. While the first two present the results as lists of individual names, the last two consider the catalogs as units. With this tetralogy, Kunitzsch closed this chapter and moved on to the great theme of his life, the Greek-Arab and Arabo-Latin tradition of Ptolemy's Almagest.

Per aspera ad astra: The Almagest enterprise

For his habilitation thesis Kunitzsch took on the Herculean task of studying the tradition and terminology of the Arabic and Latin versions of the Almagest.[7] His earlier works had expressly avoided the subject due to the lack of editions of the relevant material.[8] It must have been arduous labor to bring together the numer-

4 *Untersuchungen zur Sternnomenklatur der Araber,* Wiesbaden: Harrassowitz, 1961, No. 4.
5 *Typen von Sternverzeichnissen in astronomischen Handschriften des zehnten bis vierzehnten Jahrhunderts*, Wiesbaden: Harrassowitz, 1966, No. 8.
6 "Das Fixsternverzeichnis in der 'Persischen Syntaxis' des Georgios Chrysokokkes," *Byzantinische Zeitschrift* 57 (1964): 382–411.
7 *Der Almagest. Die Syntaxis Mathematica des Claudius Ptolemäus in arabisch-lateinischer Überlieferung*, Wiesbaden: Harrassowitz, 1974, No. 35.
8 *Sternnamen* p. 2.

ous manuscripts of the text and to collect all the sources containing information on the translation of the Almagest.

In a first "analytical part," he examined all available sources for the five Arabic translations and the one Arabic-Latin translation as well as their manuscripts. His second "documentary part" addressed terminological problems, including the important new finding that the name "Almagest" was not an Arabic transcription of the Greek word, but had been transmitted from a Pahlavī source in which the Greek μεγίστη ("largest" fem. sing.) was translated into *mgstyk* (leaving out the Pahlavī suffix *-k* for the Arabic term). A significant part contains a terminological analysis of the star catalogue in Books VII and VIII of the Almagest, with lists of the 48 constellations and the 610 stars with characteristic descriptions of the positions of the stars within the constellations (the rest of the, in total, 1025 stars in the catalogue contain only notes on the position relative to another star, such as "the star that follows star X"). One year later, he published the *editio princeps* of the most important Arabic source text on the Almagest star catalogue, written by the 12th-century scholar Ibn aṣ-Ṣalāḥ.[9] Both publications were a preparation for the following work that remains his definitive contribution to the field.

Kunitzsch's work on the Almagest culminated in his magnum opus *The Star Catalogue of the Almagest. The Arabic Medieval Tradition* in three volumes.[10] The first volume contains the *editio princeps* of the two existing Arabic translations of al-Ḥajjāj and Isḥāq ibn Ḥunayn, the second contains the first critical edition of Gerhard von Cremona's Latin translation from Arabic, both with German translations. The third volume comprised a concordance of star coordinates in the Greek, Arabic and Latin tradition. He included information from the star catalogue of aṣ-Ṣūfī and used the critical comments of Ibn Ṣalāḥ and the data in the star catalogue of Naṣīr ad-Dīn aṭ-Ṭūsī's unpublished *Taḥrīr* of Almagest. He also used the medieval Graeco-Latin translation. The work marks the magnificent conclusion of Kunitzsch's more than thirty years of work on star names and star catalogues, in which he had blazed a trail for the entire field in what amounts to a one-man operation.

9 *Ibn aṣ-Ṣalāḥ. Zur Kritik der Koordinatenüberlieferung im Sternkatalog des Almagest. Arabischer Text nebst deutscher Übersetzung, Einleitung und Anhang*, Göttingen, Vandenhoeck & Ruprecht, 1975, No. 49.

10 *Der Sternkatalog des Almagest. Die arabisch-mittelalterliche Tradition*, Wiesbaden: Harrassowitz, 1986–1991, No. 133a–c.

From Graeco-Arabic spherics to terra astronomy

When Paul Kunitzsch reached the age of sixty-one, he moved on to various other topics. A new main field of work that we can determine were Greek-Arabic texts on spherical astronomy. Together with Richard Lorch, he published three *editiones prinicipes* of the Arabic versions of the works of Theodosios of Bitunia, "Spherics," "On Habitations," and "On Days and Nights."[11] Of further interest was celestial cartography. Sky maps and globes in east and west came into focus.[12] In the last years of his life, he was involved in a newly emerging field in the history of astronomy, called "Terra-Astronomy," the study of historical observations, motivated by contemporary astrophysical questions.[13] He worked together with the team around Ralph Neuhäuser on historical records of supernovae and other celestial phenomena.[14] In addition to these topics, Kunitzsch found the time to write smaller articles on a variety of topics. He published 96 book reviews and, additionally, entries in encyclopedias, such as the *Encyclopaedia of Islam, 2nd edition*, the *Encyclopaedia of Islam Three*, the *Encyclopaedia Iranica*, the *Encyclopaedia of Qurʾān*, the *Lexikon des Mittelalters*, the *Encyclopaedia of Scientific Biography* and others. Since 1985 he had been a "full member" of the "Bavarian Academy of Sciences" and published a series of monographs as "session reports."[15] Together with Menso Folkerts, he translated and published a new critical edition of the work al-Ḫwārizmī on the Indian arithmetic in the series "Abhandlungen" of the Bavarian Academy.[16] Besides what was published under his name, Kunitzsch invested much of his time in helping colleagues with their publications by sending corrections and additions, or by meeting them in person and discussing textual problems. His expertise was thus not limited to his own publications and found its way into the works of his colleagues.

11 Nos. 329, 331, and 332.

12 Globes: Nos. 256, 263, 322, 327, 335, 337, 342, 362, 367; maps: Nos. 310, 334.

13 Neuhäuser, Ralph, Neuhäuser, Dagmar L., and Posch, Thomas, "Terra-Astronomy – Understanding historical observations to study transient phenomena," *Astronomy in Focus, as Presented at the IAU XXX General Assembly, Vienna, Austria 2018*, edited by Maria Teresa Lago, Cambridge: Cambridge University Press, 2020, 163–166.

14 Nos. 344, 346, 347, 350, 351, 360, and 364.

15 Nos. 110, 134, 171, 181, 200, 234, 289, and 331.

16 *Die älteste lateinische Schrift über das indische Rechnen nach al-Ḫwārizmī*, Abhandlungen. Bayerische Akademie der Wissenschaften, Philosophisch-Historische Klasse, Neue Folge 113, edited and translated by Menso Folkerts and Paul Kunitzsch, München: Beck, 1997, No. 230.

Continuing the legacy of Paul Kunitzsch: The PAL project

With Paul Kunitzsch and Menso Folkerts, who held the chair for the history of science at the university and had become "full member" of the Academy, Munich had become a center for the history of science in the Middle Ages both in the Middle East and in Europe. This came to an end when Menso Folkerts retired in 2008. Kärin Nickelsen's appointment to the chair of the history of science in 2011 shifted its focus to the 18th to 20th centuries.

But the study of pre-modern science was to return unexpectedly to Munich. The German "Union of German Academies of Sciences and Humanities" had agreed to finance the project "Ptolemaeus Arabus et Latinus" (PAL) for a period of 25 years.[17] It is an immediate continuation of Kunitzsch's work on the Almagest, and one of its two research leaders, Benno van Dalen, is a former research associate of Menso Folkerts. One of the aims of the project is to produce complete editions of all existing pre-modern translations of the Almagest. The project team was always in close contact with Paul Kunitzsch, on whose shoulders they stand. What Kunitzsch began as a lone pioneer is now continued by a large team of younger scholars. The fact that this has become possible gives hope for the future of the philologically based study of the history of science, one of whose great masters was Paul Kunitzsch.

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